

TWO NEW ANDEAN SPECIES OF *SOLANUM* SECTION *CRINITUM* (SOLANACEAE)

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ABSTRACT

Two new species of *Solanum* section *Crinitum* are described here from the eastern slopes of the Andes and adjacent lowlands. ***Solanum cyathophorum*** M. Nee & Farruggia closely resembles *S. altissimum* and *S. kioniotrichum*, but differs from the other two by the presence of truncate calyx lobes. ***Solanum adenobasis*** M. Nee & Farruggia has close affinities to *S. grandiflorum* and *S. acanthodes* but differs from the latter two species in having short but prominent glandular hairs emerging from the base of the long stalk of the stellate hairs found along the stem and adaxial surface of the petiole.

RESUMEN

Se describen dos especies nuevas de *Solanum* sección *Crinitum* de las laderas orientales de los Andes y tierras bajas adyacentes. ***Solanum cyathophorum*** M. Nee & Farruggia se asemeja a *S. altissimum* y *S. kioniotrichum*, pero se distingue de las dos por los lóbulos truncados del cáliz. ***Solanum adenobasis*** M. Nee & Farruggia se parece a *S. grandiflorum* y *S. acanthodes* pero se diferencia de éstas por los pelos glandulares cortos pero prominentes en la base de los pelos estrellados con estipes largos que se encuentran en las ramas y superficie adaxial de los pecíolos.

KEY WORDS: *Solanum*, Andes, new species

The economically important genus *Solanum*, which includes tomato (*S. lycopersicum*), potato (*S. tuberosum*), and eggplant (*S. melongena*), has been a subject of taxonomic study for hundreds of years. It is currently the focus of an initiative to provide online descriptions and taxonomic information for all *Solanum* species (the PBI *Solanum* project; www.solanaceaesource.org). Herbarium surveys and revisionary studies on *Solanum* section *Crinitum* Whalen ex A. Child as well as new field work conducted as part of this project have identified two undescribed species within the section, which are treated below.

Solanum section *Crinitum* is part of the species-rich subgenus *Leptostemonum* (Dunal) Bitter, recognized as a group by Linnaeus (1753) on the basis of prickles ("spines") and colloquially known as the "spiny solanums." By the mid-1800s, the subgenus had been well-differentiated from other groups of *Solanum* by the combination (with very few exceptions) of the presence of prickles, tapered anthers, and, stellate hairs. Modern molecular studies have sampled many species, and subgenus *Leptostemonum* almost perfectly coincides with the informally named *Leptostemonum* Clade (Bohs 2005; Levin et al. 2006). Current phylogenetic evidence (Levin et al. 2006; F.T. Farruggia and L. Bohs, unpublished data) supports sect. *Crinitum* as a monophyletic group, and the molecular data of Levin et al. (2006) suggest that it may be closely related to sect. *Androceras* (Nutt.) Marzell.

Species of section *Crinitum* are distinguished from the other spiny solanums due to the fact that they are primarily medium to large trees with large purple flowers. Their fruits range in size from approximately 1 to 15 cm in diameter and have a swollen to knobby calyx at maturity. The juvenile plants are usually densely covered with broad-based prickles, and some have leaves approaching 1.5 m in length. The group as circumscribed by Whalen (1984) and Nee (1999) includes from 8 to 14 species. One of these species, *S. mitlense* Dunal, only tentatively placed in this section (Nee 1999), is endemic to Mexico while the rest

are restricted to tropical South America, with highest diversity along the wet tropical eastern slopes of the Andes.

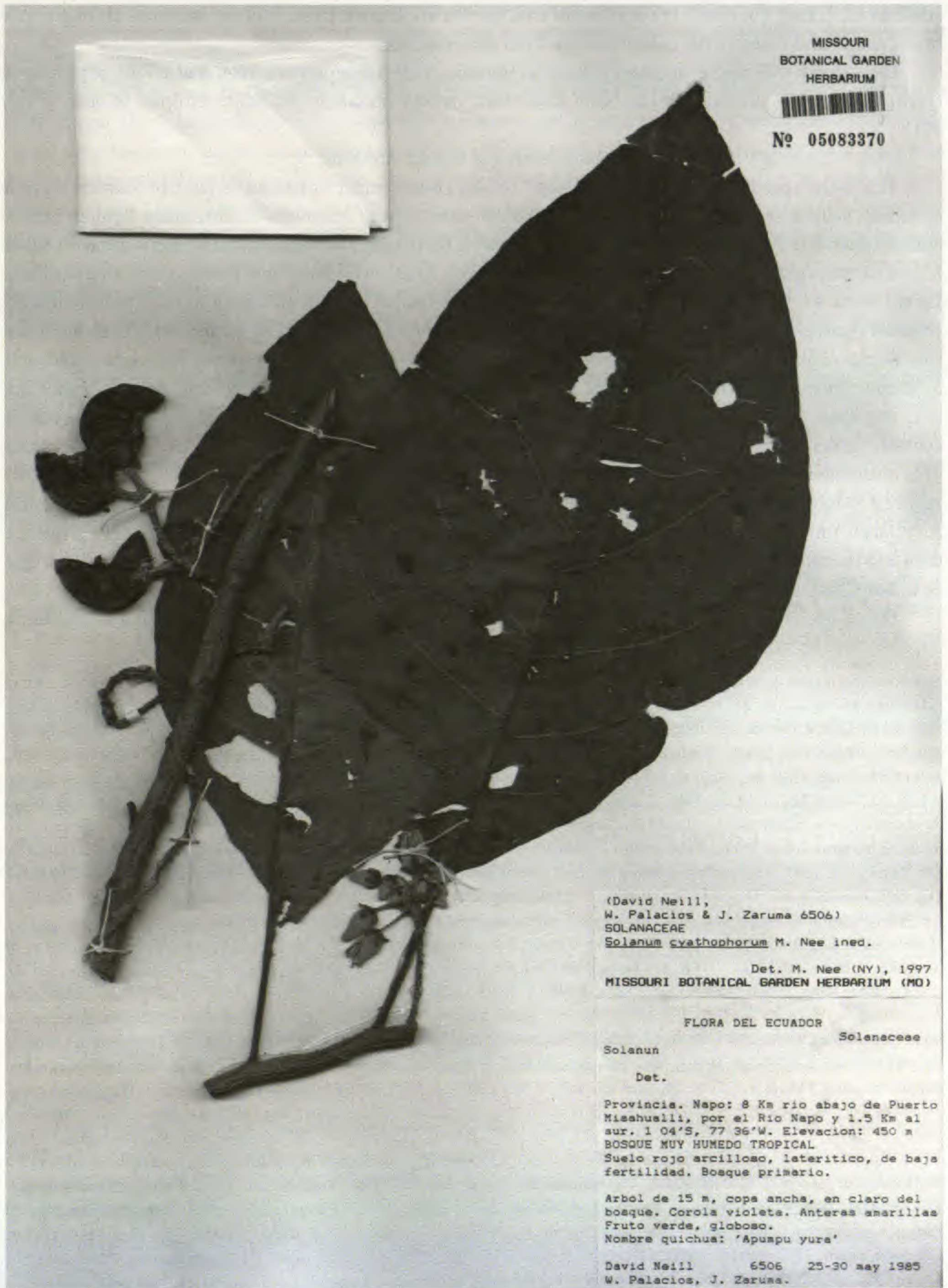
Solanum cyathophorum M. Nee & Farruggia, sp. nov. (**Fig. 1**). TYPE: ECUADOR. NAPO: 8 km río abajo de Puerto Misahualli, por el Río Napo y 1.5 km al sur, 01°04'S, 77°36'W, 450 m, 25 May 1985, D. Neill, W. Palacios & J. Zaruma 6506 (HOLOTYPE: QCNE; ISOTYPES: MO, NY, QAME).

Arbor, 3–10(–20) m × ca. 60 cm diametro, truncus aculeis crassis armatus, flores magnae, corollis 4.5–5 cm diametro, stellatis ad rotato-stellatis, fructus globosus, glaber, 1–1.9 cm diametro. *Solano altissimo* et *S. kioniotricho* affinis sed calycibus cupulatis lobis truncatis ad apices et corollis in alabastro manifestis differt.

Tree 3–10(–20) m × ca. 60 cm dbh. Trunk with sharp, stout broad-based prickles, the bark light tan to dark, wrinkled in vertical ridges, the slash soft, white with yellow fibers; flowering stems unarmed, glabrous to densely pubescent with sessile to short-stalked light tan multangulate-stellate hairs, the multangulate apex 0.1–0.3 mm in diameter, the rays 7–10+. Sympodial units difoliate, geminate. Leaves simple, the blades 15–30 × 7–15 cm or more, ca. 2 times as long as wide, elliptic to lanceolate, chartaceous to subcoriaceous, slightly discoloured, the fresh and dried leaves dark green and somewhat shiny adaxially, lighter green to golden-tan abaxially, the adaxial surface nearly glabrous to moderately pubescent with stalked reduced-stellate hairs, the stalks ca. 0.1–0.3 mm, multiseriate at the base, rays 1(–2), eglandular, the abaxial surface mostly densely pubescent with golden-tan sessile to multiseriate-stalked porrect-stellate hairs, the stalks 0–0.03 mm, the rays 5–8, the midpoints absent; major veins 8–9 on either side of midvein; base cuneate to oblique; margin entire to shallowly repand; apex acute to acuminate; petioles (2–)4–5 cm, glabrous to densely pubescent with hairs like those of the young stems. Inflorescences 2.5–4.5 cm, extraaxillary, unbranched or branched, with 8–15 flowers, the plants strongly andromonoecious, with one to few hermaphroditic flower(s) at the base of the inflorescence and all other flowers functionally staminate, the axes densely stellate-pubescent with hairs like those of the stems, unarmed; peduncle 2–5 mm; rachis 2.3–4.2 cm; pedicels 10–15 mm in flower and fruit, densely congested, spaced 1–4 mm apart, articulated at base. Flowers 5-merous. Calyx ca. 4.5 mm long, the tube at anthesis 1.1–1.4 mm, the lobes ca. 2.5 × 2 mm, the apex truncate to broadly obtuse, the abaxial surface densely pubescent with short-stalked to sessile porrect-stellate hairs, unarmed; fruiting calyx tube becoming slightly inflated and knobby, the lobes 5–5.5 × 3–3.9 mm, slightly reflexed, subtending the fruit. Corolla 4.5–5 cm in diameter, 22–23 mm long, stellate to rotate-stellate, lobed for more than half of its length, membranaceous, violet to blue, the tube 6–7.5 mm, the lobes 11–14 × 3–3.5 mm, lanceolate, with moderate interpetalar tissue, sparsely pubescent adaxially with sessile porrect-stellate hairs, the rays 5–8, the midpoints often pronounced, ca. 0.1 mm long, densely pubescent abaxially along central portion of lobes with sessile porrect-stellate hairs. Stamens equal, the filament tube 0–0.1 mm, the free part of the filaments 1.5–1.8 mm, glabrous; anthers ca. 1.3 × 2.8 mm, tapered, not connivent, yellow, the pores directed distally, not opening into longitudinal slits with age. Ovary glabrous to sparsely pubescent with stalked glandular hairs; style in hermaphroditic flowers 14–15 × 0.2–0.5 mm, cylindrical, emergent from anther column, curved at apex, glabrous or sparsely pubescent in lower half with sessile stellate or short-stalked unbranched glandular hairs; style in staminate flowers 4–4.5 × ca. 0.2 mm, cylindrical, included within anther column, straight at apex, glabrous or sparsely pubescent in lower half with sessile stellate or short-stalked unbranched glandular hairs; stigma capitate, slightly bilobed. Fruit a berry, 1–1.9 cm in diameter, globose, apparently green and juicy at maturity, glabrous, the pericarp thin. Seeds 2.6–3 × ca. 2.5 mm, strongly flattened, reniform, orange to light brown, rugose.

Distribution and phenology.—Clearings and open places in disturbed, transitional and lowland tropical rainforest, 200–1100 m in elevation, mainly along the eastern Andean slopes in Ecuador, but extending into southern Colombia and northern Peru. Flowering specimens were collected in February–August and October–December. Fruiting specimens were collected in February, May, August–September and November–December.

Conservation status.—According to the IUCN Red List Categories (IUCN 2010), *S. cyathophorum* is clas-



MISSOURI
BOTANICAL GARDEN
HERBARIUM
No 05083370

(David Neill,
W. Palacios & J. Zaruma 6506)
SOLANACEAE
Solanum cyathophorum M. Nee ined.

Det. M. Nee (NY), 1997
MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

FLORA DEL ECUADOR
Solanaceae

Solanum

Det.

Provincia. Napo: 8 Km rio abajo de Puerto
Misahualli, por el Rio Napo y 1.5 Km al
sur. 1 04'S, 77 36'W. Elevacion: 450 m
BOSQUE MUY HUMEDO TROPICAL
Suelo rojo arcilloso, lateritico, de baja
fertilidad. Bosque primario.

Arbol de 15 m, copa ancha, en claro del
bosque. Corola violeta. Anteras amarillas
Fruto verde, globoso.
Nombre quichua: 'Apumpu yura'

David Neill 6506 25-30 may 1985
W. Palacios, J. Zaruma.

Fig. 1. *Solanum cyathophorum* M. Nee & Farruggia. Image of isotype [D. Neill, W. Palacios & J. Zaruma 6506 (MO)].

sified as LC (Least Concern). Populations of this species are known from multiple locations throughout a broad range, and many of the collections are from protected areas.

Local names.—Ecuador: apumpu (Quichua, *Hurtado* 2733); apumpu yura (*Neill et al.* 6506); papa mandi (*Freire et al.* 2175); untukar (Shuar, *Shiki* RBAE222); bamba (*Mowbray* 702102); ttotopaje (Cofán, *Cerón* 301).

Uses.—*Cerón* 301 reports that the bark is used to induce vomiting.

This is the species listed as “sp. nov. ined.” in Nee (1999) under unnamed series 1 of *Solanum* section *Crinitum*. Within section *Crinitum*, *S. cyathophorum* most closely resembles *S. altissimum* Benítez and *S. kioniotrichum* Bitter ex J. F. Macbr. *Solanum altissimum* is distributed throughout the western Amazon Basin from Colombia and Venezuela to Peru and western Brazil. *Solanum kioniotrichum* is endemic to Departamento Loreto, Peru. All three species have small round glabrous fruits (1–2 cm) and predominantly entire leaves. *Solanum cyathophorum* differs from *S. altissimum* and *S. kioniotrichum* in having a calyx with truncate lobes that do not completely cover the corolla in bud, thus exposing the end of the corolla. In *S. altissimum* and *S. kioniotrichum* the calyx lobes are acute to obtuse and completely cover the corolla in bud, only splitting later to expose the corolla. The adaxial leaf surfaces of *S. cyathophorum* are either completely glabrous or sparsely pubescent with hairs having a multiseriate stalk and 1–2 horizontal apical ray cells. Specimens of *S. altissimum* have similar hairs on the adaxial leaf surface, but may include hairs which are stellate or reduced to rounded knobs. *Solanum kioniotrichum* can be easily distinguished from both *S. altissimum* and *S. cyathophorum* by the pronounced basal cells of the adaxial leaf hairs. Evidence from nrDNA ITS sequence data and morphology suggests that *S. cyathophorum* is most closely related to *S. altissimum* (F.T. Farruggia & L. Bohs, unpublished data).

Etymology.—The name refers to the shape of the calyx: cyatho- (from the Greek “kyathodes”), meaning cuplike, and the suffix -phorum, meaning to bear or carry.

Additional specimens examined: **COLOMBIA. Putumayo:** Comisaría del Putumayo, márgenes del Río Putumayo entre la desembocadura del Güamués y Puerto Asís, 270 m, 21 Dec 1940, *J. Cuatrecasas* 11245 (COL, F, US). **ECUADOR. Morona-Santiago:** Gualaquiza Cantón, Valle del Río Quimi, 1090 m, Dec 2000, *M. Cerna et al.* 387 (BM, MO, NY); Cantón Tiwintza, Parroquia Santiago, road Santiago–Patuca, 3°01'14"S, 78°03'03"W, 350 m, 15 Aug 2005, *J.L. Clark* 9311 (NY, US); bosque tropical húmedo de Amazonas Taisha, 2°23'S, 77°30'W, 500 m, 14–15 Oct 1975, *E. Little et al.* 703 (QCNE, US); El Centro Shuar Kankaim, (Cangaimine), Río Kankaim (Cangaime), (20 km WNW del Taisha), 500 m, 15 Oct 1985, *D. Shiki* RBAE222 (MO, NY). **Napo:** Aguarico, Reserva Étnica Huaorani, carretera y oleoducto de Maxus en construcción, km 61, al S del Río Tivacuno, 250 m, 26 Oct 1993, *M. Aulestia* 1177 (NY); Cantón Lago Agrio, Duremo, Comunidad indígena Cofán, 350 m, 4 May 1986, *C. Cerón* 301 (MO, NY); Lago Agrio, between Lago Agrio and Santa Cecilia, 28 Jul 1972, *J.D. Dwyer* 10285 (MO, NY); Orellana, Parque Nacional Yasuní, carretera y oleoducto de Maxus en construcción, km 6–9, 250 m, 12 Dec 1993, *A. Grijalva* 697 (BM, MO, NY); Misahualli, in the surroundings of the junction Río Misahualli–Río Napo, 500 m, 13 Aug 1979, *L.B. Holm-Nielsen et al.* 19119 (AAU, MO, NY); Aguano, edge of the town Aguano (also Ahuano) on the Río Napo, 550 m, 14 Feb 1973, *J. Humbles* 6204 (F, MO); Cantón Archidona, Huiruno, al pie del Volcán Sumaco, carretera Hollín–Loreto, 5 km al SW de Loreto, 450 m, 24 Nov 1989, *F. Hurtado* 2733 (MO, NY); Lago Agrio, carretera hacia Río San Miguel, 11 Feb 1980, *J. Jaramillo & F. Coello* 2227 (NY, QCA); Ahuano, at Río Napo, 25 Mar 1969, *H. Lugo* S. 880 (GB, MO); Las Sachas, Las Sachas road Coca (Puerto Francisco de Orellana), Lago Agrio, 30–40 km NE of Coca, 13 Feb 1973, *H. Lugo* S. 3395 (GB, MO); Guamanyacu, road Coca (Puerto Francisco de Orellana)–Lago Agrio, ca. 40 km NE of Coca, 18 Feb 1973, *H. Lugo* S. 3396 (GB, MO); Santa Rosa de Quijos, road Lago Agrio–Baeza, 24–26 km NE of Baeza, 28 Feb 1973, *H. Lugo* S. 3585 (GB, MO); Limoncocha, pasture N of runway, Feb 1970, *R.N. Mowbray* 702102 (MO); Estación Experimental INIAP-Payamino, 5 km al N de Coca, 250 m, 9 Sep 1986, *D. Neill et al.* 7341 (NY); km 42, carretera Lago Agrio–Coca, Plantación Experimental de Corp. Forestal Durini, 450 m, 21 Sep 1985, *W. A. Palacios et al.* 815 (NY); Cantón Loreto, Vía Payamino–Loreto, Comunidad Jumandi, 350 m, Jul 1993, *W. A. Palacios* 10953 (BM, F, NY); 15 km al W de Coca, costado S del Río Napo, por vía de Los Zorros, 0°35'S, 77°02'W, 250 m, 18–20 Apr 1985, *Zaruma et al.* 114 (MO, NY, US). **Pastaza:** ca. 15 km N of Puyo along side road to the E, 1000 m, 27 Dec 1987, *B.M. Boom et al.* 7831 (NY, QCA, US). **Sucumbios:** Cascales Cantón, Parroquia El Dorado, Cooperative Los Angeles, Bloque 11 Compañía Santa Fe, 3 km entre La Troncal y Los Ángeles, 250 m, 3 May 1997, *E. Freire et al.* 2175 (MO). **Zamora-Chinchi:** El Panguí, Cordillera del Cóndor, valle del Río Quimi, 920 m, 10 Dec 2001, *L. Miranda* 140 (NY). **PERU. Loreto:** Dtto. Tigre, Río Corriente, Shiviayacu, camino a Forestales (39 km), 25 Nov 1979, *F. Ayala* 2315 (MO, NY); basin of Río Ucayali, vic. Jenaro Herrera, 4°55'S, 73°45'W, 13 Feb 1988, *D. Daly et al.* 5643 (MO, NY); Río Javari, behind Angamo Garrison, 4 Aug 1973, *E. Lleras et al.* P17133 (MO, NY, UFMT).

Solanum adenobasis M. Nee & Farruggia, sp. nov. (**Fig. 2**). TYPE: PERU. DEPT. AMAZONAS: Bagua, near Puente Almendro I, km 296 of Marañón road (from Olmos junction), 5°15'S, 78°20'W, 620 m, 6 Jul 1984, *S.D. Knapp & J. Mallet* 6565 (HOLOTYPE: USM; ISOTYPES: F, GH, NY).

Arbor, 3–10(–20) m × ca. 6–12 cm diametro, truncus aculeis crassis armatus, flores magnae, corollis 4–6(–8) cm diametro, rotato-stellatis, fructus globosus, glaber, 4–7 cm diametro. *Solano acanthodi* et *S. grandifloro* affinis sed pilis glanduliferis ad basim pilorum stellatorum caulium vestitis differt.

Tree 3–10(–20) m × ca. 6–12 cm dbh. Trunk with sharp, stout broad-based prickles, the bark light tan to dark brown, thin, the slash soft, white with yellow fibers; juvenile stems densely covered with stout broad-based prickles; flowering stems unarmed or with broad-based prickles, often densely pubescent with long multiseriate-stalked porrect-stellate hairs, the stalks 4–5 mm long, the base of the stalk with a tuft of small glandular hairs, the stellate apex 2–3 mm in diameter, the rays 3–6, the midpoint ca. 0.5 mm long. Sympodial units difoliate, geminate. Leaves simple, the blades 30–120 × 15–45 cm or more, ca. 2 times as long as wide, ovate to lanceolate, chartaceous, the fresh leaves dark green and somewhat shiny adaxially, lighter green to golden-tan abaxially, the adaxial surface moderately pubescent with multiseriate-stalked porrect-stellate hairs, the stalks 1–2.5 mm, the stellate apex 1–2 mm in diameter, the rays 2–4(–6), eglandular, the abaxial surface densely pubescent with golden-tan multiseriate-stalked porrect-stellate hairs, the stalks ca. 1 mm, the rays 5–6, the midpoint lacking; major veins 5–6 on either side of midvein; base cuneate to oblique; margin shallowly lobed to nearly entire, the lobes deltoid; apex acute to acuminate; petioles 6.5–9(–30) cm, moderately to densely pubescent with hairs like those of the young stems. Inflorescences 2.5–8 cm, extraaxillary, unbranched or once-branched, with 8–15 flowers, the plants strongly andromonoecious, with one to few hermaphroditic flower(s) in the inflorescence and all other flowers functionally staminate, the axes densely stellate-pubescent with hairs like those of the stems, unarmed; peduncle 0.5–3 cm; rachis 2–7.5 cm; pedicels 5–17 mm in flower and fruit, densely congested, spaced 1–4 mm apart, articulated at base. Flowers 5-merous. Calyx 12–15 mm long, the tube at anthesis 1.1–2 mm, the lobes 11–14 × 2.5–3 mm, the apex acute to acuminate and thick, the abaxial surface densely pubescent with long-stalked porrect-stellate hairs, the stalks 2–3 mm with glandular hairs present at base, unarmed; fruiting calyx tube becoming strongly inflated and knobby, the lobes 10–35 × 8–18 mm, subtending the fruit. Corolla 4–6(–8) cm in diameter, rotate-stellate, lobed for more than half its length, membranaceous, violet fading to white, the tube 20–23(–28) mm, the lobes 29–36(–39) × 6–7 mm, deltate, with abundant interpetalar tissue, the adaxial surface glabrous or with sparse sessile to short-stalked stellate to multangulate hairs along midvein near apex, the abaxial surface densely covered along lobes with sessile porrect-stellate hairs. Stamens equal, the filament tube 0–0.1 mm, the free part of the filaments 1.7–2 mm, glabrous; the anthers 11–14 × 1.8–2.1 mm, tapered, connivent, yellow, the pores directed distally. Ovary glabrous; style in hermaphroditic flowers 12–15 × 0.5–0.8 mm, cylindrical, emergent from anther column, curved at apex, sparsely pubescent at base with short glandular hairs; style in staminate flowers 2–3.2 × ca. 0.2 mm, cylindrical, included within anther column, straight at apex, sparsely pubescent at base with short glandular hairs; stigma short-cylindrical to capitate. Fruit a berry, 4–7 cm in diameter, globose, green and juicy at maturity, glabrous and lustrous, the pericarp thin. Seeds 2.5–3.5 × 2.5–3 mm, strongly flattened, reniform, orange to light brown, rugose.

Distribution and phenology.—Clearings and open places in disturbed, lowland to upland tropical rainforest, 180–1200(–1600) m in elevation, mainly along the eastern Andean slopes in southern Ecuador and northern Peru. Flowering specimens were collected March–December. Fruiting specimens were collected May–December.

Conservation status.—According to the IUCN Red List Categories (IUCN 2010), *S. adenobasis* is classified as VU-B1a+biii; A2c; D1 (Vulnerable). Populations of this species are located near expanding population centers leading to highly fragmented populations. The extent of occupancy is estimated to be less than 25,000 km², and there are estimated to be less than 1,000 mature individuals across its range. There is also a continuing decline in suitable habitat in these regions due to deforestation and the establishment of new settlements.

Local names.—Ecuador: pungalá (Narváez 446); untukar (Shuar, Kunkumas RBAE184). Peru: untukag (Ancuash 460).

Uses.—Used as a graft with the edible-fruited naranjilla, *Solanum quitoense* Lam. (Narváez 446). According to Kunkumas RBAE184 the fruit is not edible.

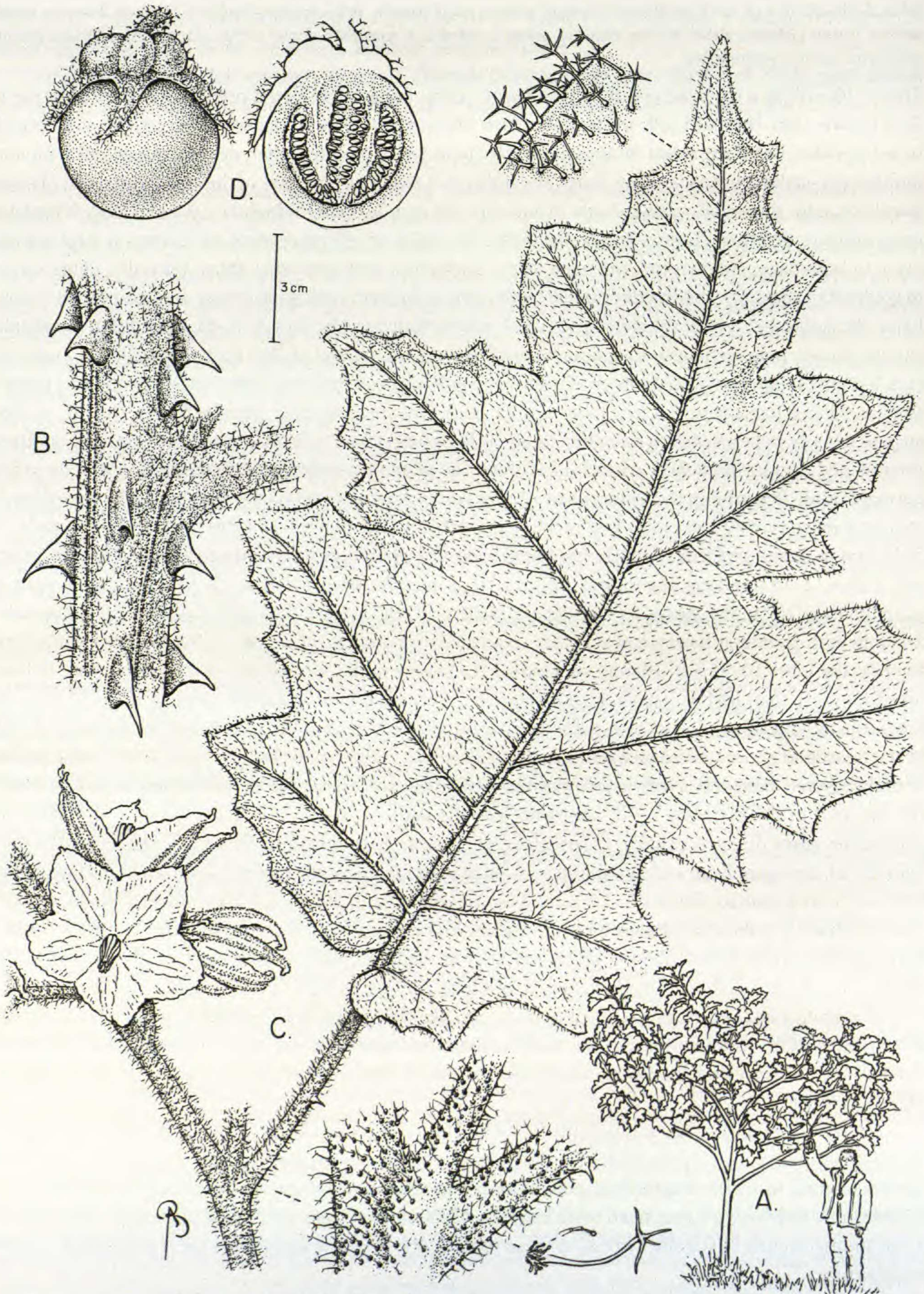


FIG. 2. *Solanum adenobasis* M. Nee & Farruggia. A. Habit. B. Juvenile stem with stout recurved prickles. C. Flowering branch showing rotinate staminate flower and stellate hairs with glandular bases. D. Fruit with prominent swollen calyx. Drawn from photos of L. Bohs et al. 3808 & 3833 (UT).

This species was alluded to as one of the unnamed species of Series 4 of sect. *Crinitum* by Nee (1999), all of which are characterized by shiny, glabrous, smooth-walled fruits about 4–7 cm in diameter. Within *Solanum* section *Crinitum*, *S. adenobasis* most closely resembles *S. acanthodes* Hook.f. and *S. grandiflorum* Ruiz & Pav. The distribution of these three taxa overlaps in Peru and Ecuador; however, *S. grandiflorum* is more widespread throughout the Andes and *S. acanthodes* is distributed throughout the western Amazon Basin, while *S. adenobasis* is restricted to northern Peru and southern Ecuador. All three species have large (4–7 cm) round glabrous fruits, more or less spiny trunks, and predominantly shallowly lobed leaves. *Solanum adenobasis* differs from *S. acanthodes* and *S. grandiflorum* in having tiny but prominent glandular hairs at the base of the long-stalked stellate hairs found on the stem and adaxial surface of the petiole. In *S. grandiflorum* and *S. acanthodes* the stems and petioles often lack long-stalked stellate hairs, but when present the stalk lack glandular hairs at the base. Furthermore, *S. grandiflorum* has a closely appressed tan stellate tomentum covering most surfaces including the calyx, while both *S. adenobasis* and *S. acanthodes* have a calyx that is covered with long-stalked stellate hairs well-separated from one another, leaving the calyx surface visible.

Etymology.—The name refers to the glandular (aden- from Greek) base (basis- from Greek) of the long-stalked stellate hairs.

Additional specimens examined: **ECUADOR. Morona-Santiago:** La Misión Salesiano, 5 km al S del Río Bomboiza y cerca la carretera Zamora–Gualaquiza, orilla del Río Bomboiza, 800 m, 23 Aug 1985, M.A. Baker 6283 (MO, NY); 10 km W del Río Zamora y 2 km al S del Río Bomboiza, alrededores de la Misión Salesiano, 3°27'S, 78°32'W, 800 m, 14 Mar 1986, M.A. Baker 6737 (MO, NY); Centro Shuar Yukutais, S of Centro, 950 m, 5 Nov 1988, B.C. Bennett & P. Gómez 3526 (NY); Centro Shuar Yukutais, 3°30'S, 78°10'W, 31 Mar 1989, B. Bennett et al. 3630 (NY, QCNE); Cantón Gualaquiza, carretera Zamora–Gualaquiza, 1000–1500 m, 21 Jun 1991, E. Gudiño et al. 1431 (NY); ca. 32.5 km S of Gualaquiza (ca. 91 km N of Zamora) on road to Zamora, 3°35'S, 78°3'W, 850 m, 4 Feb 1984, S.D. Knapp & J. Mallet 6243 (NY, US); along Méndez–Sucúa road, 2°38'S, 78°13'W, 600 m, 11 Jun 1979, B. Løjtnant 14557 (NY); Parroquia Gualaquiza, km 2 al sur de Gualaquiza, 3°25'S, 78°36'W, 1000 m, 20 Oct 1999, E. Narváez & H. Clark 446 (NY); Río Cuyes, entre Gualaquiza y Bomboiza, 3°25'S, 78°35'W, 800 m, 1 Nov 1986, D. Neill et al. 7385 (MO, NY). **Zamora-Chinchipe:** road between El Pangui and Montero departing main Zamora–Gualaquiza Road, 8.5 km N of El Pangui, 11.8 km from main highway, 2 km E of La Argelia, 10.3 km W of Guisne, 950 m, 25 May 2003, T.B. Croat & M. Menke 89341 (NY); carretera Zamora–Gualaquiza, San Roque, camino a La Delicia, 145 km de Loja Potrero, 950 m, 11 May 1996, V. Van der Eynden 753 (NY). **PERU. Amazonas:** Condorcanqui, Quebrada chichijam entsa, Río Cenepa, 402 m, 24 May 1973, E. Ancuash 460 (F, MO, NY); Condorcanqui, N of Río Cenepa, E of Quebrada Icakita, 800 m, Oct 1972, B. Berlin 268 (BM, MO, NY); Condorcanqui, confluence of Ickiti & Cenepa, 244 m, 18 Dec 1972, B. Berlin 627 (F, NY); Bagua, road between Bagua Chica & Imacita, between El Moyo and Chiriaco, 5°17'39"S, 78°24'45"W, 420 m, 30 May 2010, L. Bohs et al. 3808 (UT); Condorcanqui, Río Cenepa region, Quebrada Huampami, Río Cenepa, Monte, 182 m, May 1973, R. Kayap 820 (F); Condorcanqui, Río Cenepa, vic. of Huampami, ca. 5 km E of Chávez Valdivia, al lado de chacra de Pedro, 200 m, 14 Aug 1978, A. Kujikat 323 (MO, NY); Condorcanqui, valle del Río Santiago, Quebrada Caterpiza, 2–3 km atrás de la comunidad de Caterpiza, 180 m, 17 Mar 1980, S. Tunqui 1035 (MO, NY); Condorcanqui, Distrito El Cenepa, comunidad de Tutino, 340 m, 28 Jul 1997, R. Vásquez et al. 24441 (BM, MO, NY, USM). **Cajamarca:** Huarango, El Convento, 5°13'S, 78°40'W, 1200–1600 m, 1 Jul 1996, J. Campos & E. Rodríguez 2837 (NY, USM). **Loreto:** Maynas, Distrito Iquitos, Puerto Almendra (UNAP), 18 Sep 1972, B. Berlin 71 (BM, MO, NY). **San Martín:** Rioja, Segunda Jerusalén, ca. 15 km NW of Rioja on main road between Rioja & Pedro Ruiz, 5°58'34"S, 77°17'23"W, 820 m, 1 Jun 2010, L. Bohs et al. 3833 (UT); San Martín, 7–15 km E of Shapaja on the road to Chazuta, 400 m, 15 May 1986, S.D. Knapp et al. 7272 (F, MO, NY); Rioja, town of Naranjillo, 5°48'21"S, 77°23'54"W, 910 m, 14 Dec 2007, S. Stern et al. 156 (NY, USM, UT).

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